

## ABSTRACT OF THE DISCLOSURE

A fuel processor for rapid start and operational control. The fuel processor includes a reformer, a shift reactor, and a preferential oxidation reactor for deriving hydrogen for use in creating electricity in a plurality of  $H_2$ -- $O_2$  fuel cells. A heating and cooling mechanism is coupled to at least the shift reactor for controlling the critical temperature operation of the shift reactor without the need for a separate cooling loop. This heating and cooling mechanism produces or removes thermal energy as a product of the temperature of the combustion of air and fuel. Anode effluent and cathode effluent or air are used to control the temperature output of the heating mechanism. A vaporizer is provided that heats the PrOx reactor to operating temperature.